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PUBLIC HEALTH REPORTS

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OCCUPATIONAL DISEASES AND COMPENSATION LAWS.

THE OHIO SUPREME COURT DECIDES THAT THE WORKMEN'S COMPENSATION LAW OF OHIO DOES NOT COVER OCCUPATIONAL DISEASES.

The Supreme Court of Ohio has decided that a workman who was suffering from lead poisoning contracted in the course of his employment was not entitled to compensation under the Ohio law of 1911. That law provided for compensation to employees "injured in the course of employment." The court took the view that the legislature in adopting the law did not intend to cover injuries caused by disease, although the language used might be construed to include such injuries.

Chief Justice Nichols, in the opinion, said:

> The premium rates assessed and collected by the administering board * * * have been fixed on a basis of death and injuries by accident solely, to the entire exclusion of injury through disease. It is quite patent that any other construction would necessitate an immediate and striking horizontal elevation of all premium rates, and would in all probability prove a serious menace to the law itself.

Although the present constitution of the State of Ohio authorizes the legislature to provide compensation to workmen for occupational diseases, the opinion states that the present law, which was adopted in 1913, can be construed only as "wholly excluding any compensation for injury by disease, whether occupational or otherwise."

The opinion is published in full in this issue of the Public Health Reports, page 1269.

THE CONTROL OF MOSQUITOES.

WHIRLIGIG BEETLES (DINEUTES) AS A POSSIBLE FACTOR.

It has been stated that where "whirligig beetles" (*Dineutes*) are present *Anopheles* larvæ fail to thrive because of the destruction of the larvæ by the beetles. The "whirligigs" are the small, dark, oval, flattened beetles which one sees floating lightly on the surface of woodland pools and sluggish streams, usually congregated in considerable numbers, either resting quietly or performing graceful

complex curves around each other, at times darting around and around and yet seemingly never colliding.

Asst. Surg. R. C. Derivaux investigated the habits of these beetles to ascertain their probable influence in the destruction of *Anopheles* larvæ and the prevention of malaria. He found that when the beetles were placed in receptacles containing clear water in which there were *Anopheles* larvæ the hungry beetles devoured large numbers of the larvæ, but that when fragments of light débris were thrown on the water and allowed to float on the surface the beetles did not devour the larvæ, apparently having difficulty either in locating them or in securing them when located.

The inference would be that in clear water without floating débris the whirligig beetles would be a factor in destroying mosquito larvæ.

The details of the work are given in the report which follows:

A Note on the Predacious Habits of Dineutes ("Whirligig Beetles") Toward Anopheles Larvæ.

By R. C. Derivaux, Assistant Surgeon, United States Public Health Service.

In the course of a sanitary survey conducted in Anne Arundel County, Md., during the summer of 1915, with reference to rural sanitation and malaria, opportunity was afforded to make some observations on the behavior of an aquatic insect enemy of *Anopheles* larvæ, namely, one of the *Dineutes*, family of *Gyrinidæ*, and commonly known as the "whirligig beetle," or "mellow bug."

It has been stated that where *Gyrinidæ* occur, *Anopheles* larvæ fail to thrive because of the marked predacious habits of the former. J. B. Smith is quoted by Howard, Dyar, and Knab [1] as stating that the *Gyrinidæ* or so-called "whirligig beetles" which lie nearly wholly at the surface of the water are great destroyers of mosquito larvæ, and that "no *Anopheles* larva has a chance in any bit of water inhabited by them. Their surface-feeding habit and their tendency to get near the edges make them especially dangerous to *Anopheles*, which fail absolutely to maintain themselves within range of these beetles." D'Emerez de Charmoy, also quoted by Howard, Dyar, and Knab,[2] conducted studies, and he reports *Dineutes indus* as capable of "quick destruction" of *Anopheles* larvæ, 3 *Dineutes* devouring 50 larvæ in 3 hours, the minimum rate of destruction being 16 per hour. The larvæ of *Gyrinidæ* are also said to be predaceous,[3] and Theobald [4] is of the opinion that "the larvæ of the water beetles of the families *Dytiscidæ*, *Gyrinidæ*, *Hydrophilidæ*, also feed on mosquito larvæ, as do the various aquatic Heteroptera."

[1] Howard, Dyar, and Knab: Mosquitoes of North and Central America and the West Indies. Washington, 1912. Vol. 1, pp. 164–165 and 170.

[2] Ibid.

[3] Ibid.

[4] Theobald: Monograph of the Culicidæ of the World. London, 1901. Vol. 1, p. 75.

During the sanitary survey referred to, it was observed that in many instances even where whirligig beetles were numerous, *Anopheles* larvæ were not particularly difficult of detection and capture, and that far from being *Anopheles*-free, a number of areas were found where there was no appreciable influence apparent as far as propagation of *Anopheles* was concerned. Accordingly, it was considered of interest to conduct observations with a view of determining what factors influenced larva destruction by these insects, and to what extent and in what manner such destruction was effected.

A first lot of these beetles was taken in July, 1915, from a clear, sluggish stream, some 10 feet in width, not far from Annapolis. Two specimens were sent to the Bureau of Entomology for determination, and were reported as belonging to the genus *Dineutes*, family *Gyrinidæ*.

A second lot, taken from this same area, was kept in a tin container, in the water in which they were captured, and of these three were put into a white china basin, about 20 inches in diameter, filled with clean water. Twenty-two *Anopheles punctipennis* larvæ, varying in size from full grown to small, newly emerged larvæ, were then introduced, at 7 p. m.; early the next morning it was found that all but 2 of the larvæ had disappeared, the two survivors being of the smallest introduced. On the same day, at 6 p. m., the same 3 *Dineutes* were given 22 more larvæ, nearly all small, again in clean water; the following morning but 7 remained.

Three new *Dineutes* which had been given no food since their capture six days previously were placed in the container with 16 large and 6 small *Anopheles* larvæ (*punctipennis* and *quadrimaculatus*); within 15 minutes all of the large and one of the small larvæ had been devoured. Observation of the details of capture and ingestion was found impossible with as many as 3 beetles in the same container, because of the incessant whirling of the insects, with consequent disturbance of the surface of the water, but it was noted that once the larva had been located, its disappearance was effected with astonishing rapidity.

Repetition of the experiment with fresh beetles that had been similarly starved and the same number of larvæ but with the addition to the water of a moderately plentiful supply of surface débris, twigs, etc., gave very different results. Only a few of the larvæ were captured, and these, apparently, accidentally; the shelter afforded by the flotage was seemingly all that was necessary to give adequate protection to the larvæ, the beetles having great difficulty in locating the larvæ when so concealed.

In an artificial container the *Dineutes* swing lazily about on the surface, much as they do in their natural environment, until disturbed by the presence of the observer; upon alarm, they manifest the

greatest excitement, whirling about rapidly, and diving in search of hiding places. They are capable of remaining submerged for lengthy periods, carrying down with them a supply of air under the elytra, from the ends of which a terminal bubble protrudes; no feeding was observed while the insects were submerged. When feeding on the surface, the beetles locate their prey, in these experiments *Anopheles* larvæ, apparently by olfactory or tactile impression, the visual sense for near objects not being seemingly very acute, as frequently larvæ lying directly in the path of the oncoming beetle were missed as the latter swerved aside. Once located, however, the chase is brisk, and, in the absence of protecting flotage, capture is certain, the only chance of escape for the larva lying in diving beneath the surface. The larva is seized between the approximated tibiæ of the anterior extremities and at once ingested without preliminary dismemberment, and no remnants are left. It is of no moment whether the larva is taken head first or not, and the time required for capture and devouring is about 4 seconds. A single beetle, previously kept unfed for five days, was found to be capable of disposing of six *Anopheles* larvæ in as many minutes, in clear water without surface débris and in the absence of other food material.

Dineutes were found to occur in the region in which the survey was made, but seldom in the small pools and the small runs overgrown with vegetation, where *Anopheles* were found to propagate in profusion, but were noted most frequently in the more extensive courses and moving streams. Here the beetles move erratically about over the surface of the water but with decided preference for the open waters where they circulate contentedly until disturbed; no evidences of shore feeding were noted, nor were the beetles observed on waters the surface of which carried much flotage.

From these observations, it is inferred that, although capable of swift destruction of *Anopheles* larvæ under experimental conditions and in the absence of protecting vegetation and flotage, *Dineutes* alone are not of sufficient efficacy as natural enemies to justify considering waters inhabited by them as free of dangerous potentialities as *Anopheles* breeding places; their evident predilection for such waters, or portions of waters, as are not ordinarily selected by *Anopheles* for breeding purposes, together with their obvious difficulty in locating their prey when the latter has recourse to concealment in débris and vegetation, would indicate that, under natural conditions, their influence on *Anopheles* propagation is of but small practical importance.

Indebtedness is acknowledged to Mr. Frederick Knab, Bureau of Entomology, Department of Agriculture, for generic determination of this beetle.